"A solid modeling system, often called a solid modeler, is a computer program that provides facilities for storing and manipulating data structures that represent the geometry of individual objects or assemblies. ...The choice of representations used by the modeler determines its domain (i.e., which objects can be modeled), and has a strong impact on the complexity and performance of the algorithms that create or process the representations. A modeler may support several distinct representation schemes. Consistency between representations in different schemes is typically enforced by representation conversion algorithms."

– Dr. Jarek Rossignac

Our Passion

BRL-CAD's open source development is persistently and passionately obsessed with implementing a robust, powerful, flexible, and comprehensive solid modeling system that provides faithful high-performance geometric representation, efficient and intuitive geometry editing, conversion support for all common solid geometry formats, and geometric analysis tools for 3D computer-aided design (CAD).

"Solid modeling refers to theories and computations that define and manipulate representations of physical objects, of their properties, and of the associated abstractions, and that support a variety of processes. The representations and computations used in solid modeling are based on sound mathematical and physical principles, innovative and compact data structures, and efficient and reliable algorithms. They support the creation, exchange, visualization, animation, interrogation, and annotation of the digital models of the objects and their evolution."

– The Solid Modeling Association

Modeling Interface Enhancements

Users want something easy to learn, easy to use, and flexibly feature-filled so they can get their job done. BRL-CAD aspires to be that one place people go to for geometry needs with an interface users enjoy exploring and one that keeps people coming back.

Prior to being open source, BRL-CAD's modeling interface was considered "expert-friendly" and relied upon in-house expertise and training for proficiency. With an international audience, more varied needs, and more casual use, BRL-CAD's modeling interface needs to evolve.

Geometry Services

BRL-CAD's libraries have proven exceptionally effective at providing robust geometry services that are leveraged by numerous external application codes. Enhancing core geometry service functionality cascades a wealth of usability, flexibility, and feature capacities including the ability to provide multiuser access controls, comprehensive revision history, collaborative enhanced multiuser modeling, and more flexible application development.

BRL-CAD's existing geometry kernel functionality will be refactored into a comprehensive scriptable command framework with a new object-oriented geometry kernel programming API and provide a lightweight network daemon protocol for agnostic client application development.

Geometry Representation Support

At the heart of all solid modeling systems are fundamental geometric representations and data structures. BRL-CAD started with an efficient constructive solid geometry (CSG) mathematical foundation using implicit geometry. Support was later expanded to include explicit geometry but more work is required to make hybrid support pervasive.

BRL-CAD must robustly, efficiently, and faithfully support all 3D CAD models regardless of using an implicit or explicit geometric representation becoming more and more of a hybrid modeling system. Geometry formats of particular focus include volumetric models, spline-surface (e.g., NURBS) and polygonal (e.g., triangle mesh) boundary representations (BREP), and implicit primitives. Having fully hybridized geometry supports vast enhancements to the user interface, faithful geometry conversions, and a more flexible editing interface.

- ● Graphical user interface and usability enhancements
- ● Hybrid boundary representation geometry support
- ● Multiuser version-controlled geometry services
- ● Open source awareness & increased development

Primary long-term Aspirations

BRL-CAD is a *powerful* cross-platform *open source* solid modeling system that includes interactive solid geometry *editing*, ray-tracing support for *rendering* and *geometric analysis*, network-distributed *visualization* support, image and signal-processing tools, path-tracing for realistic *image synthesis*, a *performance analysis* benchmark suite, an embedded scripting interface, and a robust *high-performance* geometric representation and analysis library.

BRL-CAD

Solid Modeling for a Strong Defense

HTTP://BRLCAD.ORG

Open Source

BRL-CAD is a mature software code in production use for real CAD, solid modeling, and analysis purposes. It has been under active development since 1979 but has only been available as open source software since December 2004. The conversion from a proprietary code controlled by the U.S. government to an open source project made several hundred person-years of development effort available to an international developer community overnight.

Forever firmly emplaced as open source software, BRL-CAD development continues to accelerate through increased awareness and developer participation by establishing strong community ties and openly welcoming new developers.